Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	)	GN Docket No. 18–122
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183 (Inquiry Terminated as to 3.7-4.2 GHz)
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service	)	RM-11778

To: The Commission

REPLY COMMENTS OF GARMIN INTERNATIONAL, INC.

Garmin International, Inc. ("Garmin") files these reply comments in response to comments solicited by the Commission on the emissions limits required to protect the aeronautical radionavigation service ("ARNS") in the 4.2-4.4 GHz band from emissions from high density fixed and mobile operations in the 3.7-4.2 GHz band operating pursuant to proposed "flexible use" rules that would allow more intensive use of the band.[1] Garmin submits these reply comments to supplement the record and to correct several misstatements made by other

[1] FCC, Order and Notice of Proposed Rulemaking, *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, FCC 18-91 (released Jul. 13, 2018) at ¶ 125.

parties regarding the compatibility of proposed flexible use operations with incumbent adjacent band operations.

Garmin is concerned that several commenters, in specifically addressing the coexistence of proposed flexible use operations with incumbent Fixed Satellite Service ("FSS") stations, have made overly broad statements of adjacent band compatibility. These assertions should *not* be construed to be also true with respect to compatibility with adjacent band radio altimeter operations. For example, several commenters argue that the Commission's longstanding standard out of band emissions ("OOBE") limit will protect adjacent operations and should be adopted.[2] Garmin requests that the Commission read such broad arguments *only* within the limited context of the FSS discussion and *not* extend them to address necessary protection for the adjacent ARNS band. With aviation safety at stake, the Commission should not contemplate any changes to OOBE protection limits without first putting specific proposals out for study and comment and obtaining explicit Federal Aviation Administration ("FAA") concurrence.

Likewise, another commenter contemplates the need for adjacent band protection criteria for both FSS and ARNS operations, resulting in a potentially ambiguous conclusion:

> The Commission seeks comment on whether it should adopt additional protection criteria to ensure coexistence with adjacent band FSS operations. No additional protection is required for adjacent band operations, although, as T-Mobile has stated in the past, the Commission may wish to continue to study whether terrestrial wireless services would interfere with wireless avionics intra-communications ("WAIC") and radio altimeter operations in the 4.2-4.4 GHz band. T-Mobile supports the safe operation of WAIC and radio altimeters and urges the Commission to work with other federal agencies, such as the National Telecommunications and Information Administration and the Federal Aviation Administration, to determine an appropriate technical framework to allow mobile use at 3.7-4.2 GHz without causing harmful interference to properly engineered adjacent aviation operations.[3]

---

[2] *See* Comments of Verizon, October 29, 2018, at 24. *See also* Comments of CTIA, October 29, 2018, at 24.

[3] *See* Comments of T-Mobile USA, Inc., October 29, 2018, at 33 (footnotes omitted) ("*T-Mobile Comments*").

Again, Garmin urges the Commission to read this broad argument that "no additional protection is required" *only* in the limited context of the FSS discussion and *not* extend it to the adjacent ARNS band. Garmin agrees, however, that the Commission should urgently pursue further study of the impact of proposed flexible use operations on the adjacent ARNS band with regard to aviation safety.[4]

Further, Garmin wishes to clarify the record regarding "properly engineered" aviation systems and the request by some commenters that the Commission ensure radio altimeters are engineered with adjacent band operations in mind.[5] Radio altimeters operating in the 4.2 – 4.4 MHz ARNS band are engineered to meet FAA Technical Standard Orders, which specify minimum performance for safe and reliable operation.[6] Moreover, the product lifespan for avionics equipment such as radio altimeters is measured in decades (often exceeding 20-30 years). Significantly, there are tens of thousands of such FAA-certified radio altimeters installed in a diverse array of aircraft types across multiple market segments.[7] The Commission must

[4] Various parties have commented on the historical precedent for studies addressing protection of incumbent operations and have specifically advocated that such studies be conducted to determine protection limits for radio altimeters. *See* Comments of Garmin International, Inc., October 29, 2018 ("*Garmin Comments*"), at 8-12; Comments of Aerospace Industries Association and the General Aviation Manufacturers Association, October 29, 2018, at 2-4; Comments of Aviation Spectrum Resources, Inc., October 29, 2018 ("*ASRI Comments*"), at 6; Comments of The Boeing Company, October 29, 2018 ("*Boeing Comments*"), at 2-6; and Comments of Lockheed Martin Corporation, October 29, 2-18, at 4-5.

[5] *See T-Mobile Comments*, *supra* note 3.

[6] *See* TSO-C87, Airborne Low-Range Radio Altimeter, February 1, 1966. *See further* TSO-C87a, *Airborne Low-Range Radio Altimeter*, May 31, 2012.

[7] This estimate is based on the FAA Administrator's Fact Book (Nov 2018) at 17, which states that there are more than 7000 air carriers aircraft, each with 3 installed radio altimeters. *See Boeing Comments* at 4, stating "Boeing and other aircraft manufacturers install three radio altimeters on most large commercial aircraft for redundancy and backup." Further, many regional, business and general aviation airplanes and many helicopters have installed radio altimeters to comply with FAA mandates or voluntarily for safety benefit. *See also Garmin*

ensure that these incumbent radio altimeters, which support multiple aircraft safety systems, are protected from interference by any new, flexible use operations in adjacent bands.[8] Failure to protect these important safety-of-life systems would not only compromise aircraft safety, but also endanger the lives of pilots, crews, and passengers on a daily basis.

Garmin therefore reiterates its request that the Commission delay the adoption of any rule changes in the 3.7 - 4.2 GHz band until aviation industry testing of specific proposals under consideration has been completed and the FAA explicitly agrees that the proposed flexible use ground-based operations in the 3.7-4.2 GHz band are compatible with ARNS operations in the

---

Comments at 7, which note "the FAA mandated installation of radio altimeters in any helicopter operated under a part 135 certificate." *See also id.* at footnotes 11 and 15.

[8] Many comments filed in this proceeding reiterate the Commission's obligation to protect incumbent operations in the 3.7 – 4.2 GHz band, as well as adjacent bands. *See* Comments of Comcast Corp. and NBCUniversal Media, LLC, October 29, 2018, at 32, which seek protection for "incumbent operations and downstream consumers." *See also* Comments of the C-band Alliance, October 29, 2018, at 18, which argue "there must be a plan to define and implement the necessary technical mitigation methods that will ***protect all incumbent services*** from adjacent band-interference once terrestrial 5G services are implemented" (*emphasis added*). Nowhere are such protections needed more than in the ARNS spectrum—seamless and reliable radio altimeter operation is critical to aviation safety of life and property.

4.2-4.4 GHz band.[9] Otherwise, the Commission risks substantially compromising aviation safety.

Respectfully submitted,

GARMIN INTERNATIONAL, INC.

By: /s/ Helen E. Disenhaus

Helen E. Disenhaus
Telecommunications Law Professionals PLLC
1025 Connecticut Avenue, NW - Suite 1011
Washington, DC 20036
Phone: 202-789-3123
Fax: 202-789-3122
hdisenhaus@telecomlawpros.com
Its Attorneys

Clayton Barber
Principal Engineer

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062
(913) 440-1375 Direct
913-596-8495 Mobile
clay.barber@garmin.com

David Kight
Asst. General Counsel
Employment and Regulatory Affairs
Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062
(913) 440-6151 Direct
(913) 397-9079 Fax
david.kight@garmin.com

Dated: December 11, 2018

[9] *See Garmin Comments* at 11-12. *See also ASRI Comments* at 5-6.